Central Venous and Umbilical Venous Line Management in Newborn Intensive Care Unit (NICU)

Procedure Responsibilities and Authorisation

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Procedure Review History

Version	Updated by	Date Updated	Description of Changes
5	Leanne Baker, Richard Pagdanganan, and Ancy Jose	Dec 2017	3 yearly update
4	Leanne Baker	March 2013	3 yearly update
3	Leanne Baker, Jenni Richards & Tiv Pilapitiya	Jan 2010	Practice change – Bundles of care introduced

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1. Overview

1.1 Purpose

To ensure safe and efficient initiation, delivery and ongoing management of neonatal fluid and medications via a neonatal specific central vascular access device (CVAD), and the minimisation of infection.

CVAD in NICU includes umbilical/Broviac and peripherally inserted central catheter.

1.2 Scope

For neonates

1.3 Patient Groups

Neonates and infants in NICU

1.4 Definitions

Aseptic non-touch technique (ANTT)	Aseptic Non-Touch Technique (ANTT) is a technique that maintains asepsis and is non-touch in nature. The key parts of any procedure are identified and protected – this includes staff performing effective hand hygiene, instituting a non-touch technique when handling, and wearing the appropriate standard precautions. For the purpose of this procedure the word “STERILE” will continue to be used to describe access to the CVAD.
Broviac line	A silastic central line that is tunnelled from the skin of the chest wall into a central vein in the neck and sits just above the heart (unless otherwise specified, care is the same as for Central Venous Line). It is inserted and removed under general anaesthetic.
Bundle of care	Care bundles are groupings of best practice interventions, which individually improve care but when applied together, result in a significantly greater improvement.
Clear fluids	Neonatal Starter/Regular, sterile water, sodium chloride 0.9%, dextrose 10%
CNS	Clinical Nurse Specialist
CPAP	Continuous Positive Airway Pressure
CVAD	Central Venous Access Device
CVL	Central Venous Line (CVAD known as in NICU) is an intravenous catheter placed via a blood vessel into a great vein (in NICU these are most commonly PICC lines)
D10W	Dextrose 10%
ETT	Endotracheal tube

IA Line tray	Intra-arterial line tray - sterile pack containing instruments required for line insertion
KCl	Potassium chloride
KVO	Abbreviation for “keep vein open” on an infusion pump
Medical staff	In NICU they include Nurse Practitioner Neonatology, Clinical Nurse Specialist, Registrar and Paediatrician.
NaCl	Sodium Chloride
NCV	NICU Advanced Procedure Certificate
NNP	Nurse Practitioner Neonatology
NN Starter/Regular	Specialised neonatal total parenteral nutrition used for preterm infants or term infants unable to tolerate enteral feeds for a prolonged period: Neonatal Starter is electrolyte free and used during first few days following birth. Neonatal Regular contains electrolytes and is used once Neonatal Starter is discontinued.
PICC	Peripherally inserted central catheter
PIV	Peripherally inserted intravenous catheter
Sterile technique	A true sterile technique is not achievable in the NICU environment however the term sterile is used to enforce the importance of maintaining aseptic practice at all times
TPN	Total Parenteral Nutrition
U & E	Commonly used abbreviations for urea and electrolyte testing
Uses of CVL and UVC in NICU	• To facilitate multiple infusions of hypertonic solutions, high dextrose concentrations >12.5% and drugs over an extended period of time • To avoid the need for and physiological stress of repeated intravenous cannulation • Reduce the risk of extravasation of fluid into the tissues causing necrosis and phlebitis • Emergency vascular access for fluid and medication • Exchange transfusions
UVC	Intravenous catheter placed via the umbilicus into the inferior vena cava
VTBI	Volume to be infused – pump will alarm once volume has been delivered

2. Clinical Management

2.1 Competency required

- Registered Nurse who has completed orientation and training and achieved a NICU advanced procedure certification – NCV.

NB: A NICU specific advanced medication certification is also required when introducing medications to CVAD lines

- Medical staff - Insertion of lines

2.2 Nursing implications

Preterm infants have an immature system, therefore the nurse acts as the patient advocate. Careful observation and assessment of the infant's tolerance of any procedure must be maintained during any CVAD procedure and the maintenance of sterility must be a priority – particularly if multiple attempts at cannulation occur or when the procedure is prolonged.

To achieve this, use:

- Screen/barrier and "STOP" signs to eliminate unnecessary traffic through the room while line access is in progress
- Limit the number of people at the bedside
- Close doors
- Take care in preparing equipment
- Ensure adequate continuous monitoring of vital signs
- Maintain visualisation of the infant's chest movement, ETT or CPAP prongs and the baby's colour. The infant must be connected to the infant warmer servo probe.

2.3 Fixing of lines

Once x-ray confirms position, lines need to be secured for stability.

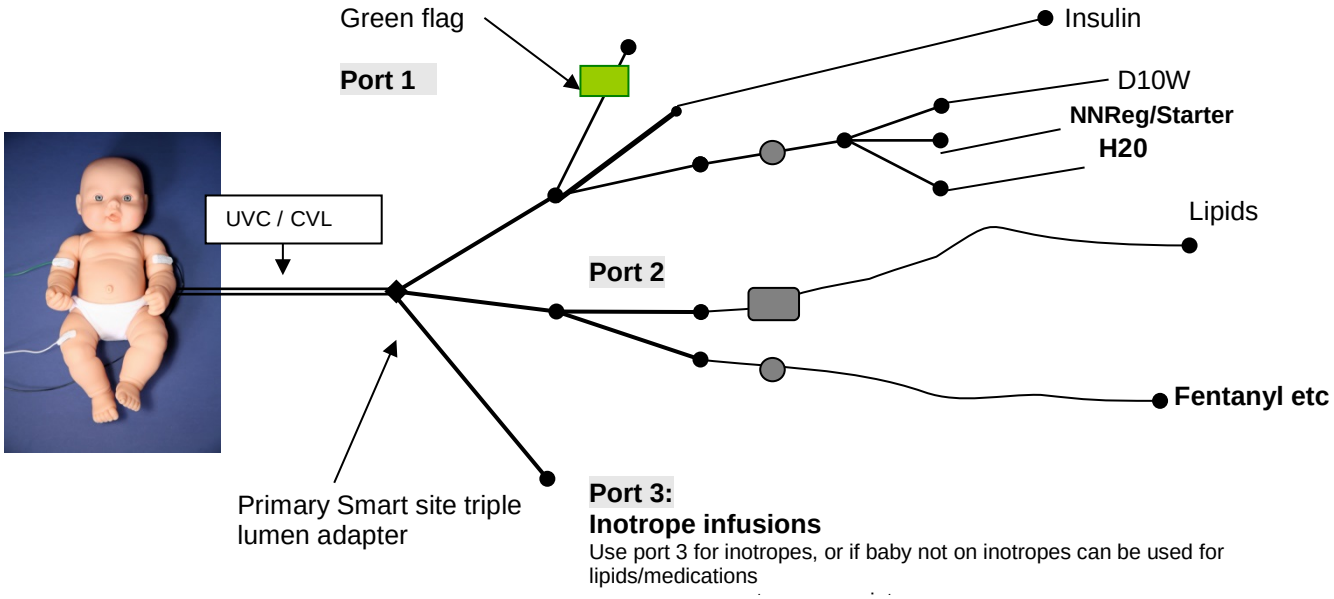
CVL – CVL is fixed and secured by medical staff on insertion under sterile conditions, nurse to ensure line is secured and comfortable outside the sterile dressing. Ensure Tegaderm does not overlap when wrapped around a limb as it may interfere with circulation when swelling or weight gain occurs.

UVC – Duoderm is placed on the skin and a bridge made with Sleek in which the tubing is coiled ensuring no tension on the line.

NB: Do not apply the Duoderm bridge for extremely low birth weight babies until they are over a week old to reduce risks of injury to the fragile skin

2.4 Placement of infusion lines

If multiple infusions are required take special care with placement. Inotropes need to be placed closest to the patient therefore require a dedicated line and filter (**Port3**). If more than one inotrope is used, a double or triple lumen smart site will be necessary. All other medications are to be infused through **Port 2** in combination with lipids, NN Starter/Regular or other maintenance clear fluids to infuse through a dedicated separate line **(Port 1**) to minimise the need to access this fluid.



2.5 Use of infusion pumps

The Alaris signature pump is to be used with clear fluid/TPN/lipid bags. Pump pressure settings must be checked and recorded hourly. Pressure limit should be set at 50mmHg, with a 4 hour VTBI set. In-line burettes to be used on all lines *except* NNStarter and term lipid bags.

When using a burette check fluid bag and burette at commencement of each shift and every time VTBI is reset. VTBI set must be LESS than amount of fluid in burette to prevent burette running dry. Even if no fluid is present in the burette the pump action will draw air from the burette into the infusion line toward the baby causing high risk of air embolus.

The Asena CC infusion pump must be used for delivery of lipids and medications. The pressure alarms must be checked and documented hourly. Due to the very small infusion volumes used in the NICU it is essential that a pump with pressure monitoring be used wherever possible, to promptly alert staff if occlusion should occur.

The Guardrail™ software **must** be used unless specified by medical staff. If guardrails is not able to be used this must be documented on the General Treatment Sheet to identify that the ml/hour setting is to be used.

It is mandatory for both nurses to set and check the Guardrail™.

Double pumping – When changing INOTROPE lines on inotrope-dependent infants using smart sites: wherever possible collect extra pumps and once inotrope is drawn up place on new pump and run each infusion through to ensure each drug is equally mixed and primed to the end of outlet. This avoids delays created when medications are running

at very low rates. If a baby is on multiple inotropes consider staggering the line changes to avoid major interruption to the delivery of medications.

It is mandatory for both nurses to check:

- **Correct infusions/medications in the correct infusion pumps**
- **Lines from baby to pump to ensure all clamps are open, no kinks or leaks are present**
- **Lines are correctly labelled for easy identification of the infusions**
- **Pump is set at the correct delivery rate, with a 4 hourly maximum VTBI set on volumetric pumps only**

2.6 Interruption to lines

This greatly increases the risk of sepsis. In order to minimise interruption to CVL/UVC fluids the following protocol will be required:

a) Every time the CVL/UVC catheter site is accessed for a dressing change, adjustment of line, infusion set change, blood sampling or transfusion of blood product; it must be done in a sterile technique as per steps in the CVL/UVC Line Changes and Maintenance Care Bundle (page 12-16). For emergency access see care bundle (page 17).

b) All accessing of a BROVIAC line must be done using the NICU SPECIFIC CVL CARE BUNDLES sterile procedure – include blood sampling, transfusion of blood products, administration of medication and line changes.

c) For an infusion set change, clean the hub, line and the smart site connector lumen with chlorhexidine in alcohol cleansing agent using single swabs generously, clean for 15 seconds and wait to allow solution to fully dry. Use a fresh chlorhexidine swab to hold the line/connector.

d) Use CVL dressing pack sterile drapes and non-touch technique for preparation, priming and connection of infusion set as described below in the Bundle of Care for CVL/UVC maintenance.

e) Immediately attached to the UVC/CVL catheter will be an Alaris smart site triple lumen extension set. The lumens will be allocated as follows:

Port 1 - Infusion giving set and filter for clear fluids, NN Regular/Starter, dextrose, sterile water, sodium chloride 0.9%, or insulin infusing on Port 1 **will be changed every 72 hours**. If bag runs out prior to 72 hours a full line change will be required. Insulin infusion without a filter – also should be changed at 72 hours. All clear fluid filters and smart sites may stay in situ for 72 hours.

Port 2 – Syringe pump infusion sets, double or triple lumen smart site adaptors as required for delivery of other medications and lipids. Medications and lipids changed 24 hourly – change syringe and extension line only. Lipid filters remain a 24 hourly change.

Port 3 **– Dedicated** inotrope port **or** use for emergency port/lipids/medications/antibiotics if no inotropes in use.

NB: Emergency port selection

The emergency port is an identified spare access port for quick access in emergencies or if a line occlusion requires flushing – usually on Port 3 if no inotropes in use. Either of the

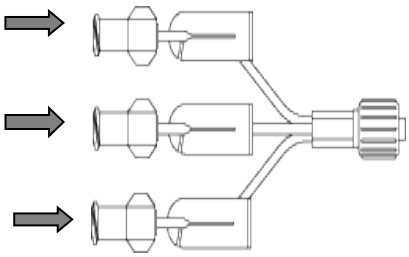
other ports may have an emergency access port included; select most appropriate port based on what medication is infusing: e.g. avoid using lines where insulin or inotropes are infusing to avoid a bolus being given if the line is flushed.

Label EMERGENCY PORT with a green flag for rapid identification

Port 1 - NNStarter+D10W/Regular/Clear fluids (dedicated port)

Port 2 - Lipids & medications

Port 3 – Inotropes or emergency port / intermittent access port for antibiotics or medication if no inotropes, antibiotic, caffeine



2.7 Additional notes

a) Babies <1000g and a small group of babies weighing >1000g with a CVL, access will have NNStarter fluid commenced as initial TPN. This fluid runs at a maximum of 30ml/kg/day therefore must be accompanied by a bag of D10W with a burette to make up remainder of total daily volume.

   Due to high protein concentration *no burette or additives* are to be infused with NNStarter.

   No cuff BPs to be used on the limb with CVL as they apply pressure directly over the vein containing the catheter which may cause compromise to its function.

b) Burettes used for additives, e.g. NaCl, KCl, may stay in the line for 72 hours. The additives can be topped up as many times as required over the 72 hour period under full sterile conditions.

c) If for any reason the Port 1 line (apart from the burette) is broken into, including under sterile conditions, all lines on that port must be changed *down to the filter (don't need to change the filter)*

d) If antibiotics are being administered via CVL through Port 3, the filter may remain in situ for 72 hours (label with date and time when changed).

e) Inspect CVL catheter insertion site hourly for signs of soiling, redness, swelling or signs of local infection. Complete and document CVL safety and assessment once per shift. Change dressing only if soiled or lifting. If suspicion of local or systemic infection consider prompt removal of catheter after discussion with consultant in charge.

f) If the CVL catheter is to remain in situ for antibiotics or any other purpose, use sodium chloride 0.9% or D10W infusion as prescribed at a minimum rate of 1ml/hr through the CVL.

   Full line change required after 72 hours using sterile technique. Generally NNRegular or Dextrose 10% solution is for KVO purposes.

g) Maintaining sterility is vital in preventing catheter-related infection and is a two-person procedure at all times. If the line is changed from one site to another or removed and replaced, all fluids, drugs, lines, filters and connections must also be replaced.

h) If blood sampling is from a UVC follow the sampling section of the NICU service specific Umbilical Arterial Catheter guideline, but use the central line sterile technique and 5ml syringes for accessing the catheter.

Lippincott Procedures provides a paediatric procedure that guides the actual sampling technique (Link on p.21)

i) When doing surgical handwashing, the basic principle is to wash hands thoroughly, then wash from a clean area (hand) to a less clean area (arm). A systematic approach to scrub is an efficient way to ensure proper technique.

Refer to Lippincott surgical scrub procedure at: http://procedures.lww.com/lnp/view.do?pId=729670

3. Practical Applications

This part of this document is dedicated to the detailed practical application of the Care Bundles that govern all the six most common central venous/umbilical venous procedures. They are listed as follows:

Sampling from a Broviac Line: http://procedures.lww.com/lnp/view.do?pId=728990

Flushing a Broviac Line: http://procedures.lww.com/lnp/view.do?pId=728993

3.1 Insertion of UVC/CVL care bundle

Equipment

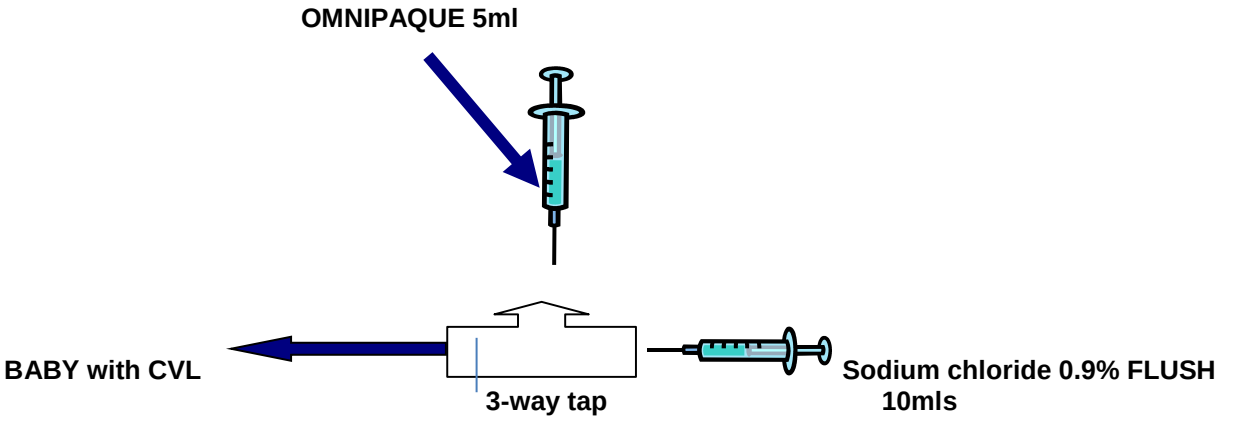
- Trolley
- Dr Gown pack x 1
- Masks & Caps x2
- Sterile Gloves
- Sterile drapes
- Neonatal I.A. Line Tray
- U.V.C. Catheter / C.V.L. Catheter
- 3 way Tap x 1
- 5 ml syringe
- 10 ml syringes
- Drawing up needles
- 0.9% sodium chloride
- Cord tie for UVC
- 4.0 Silk for UVC
- Infusion pump &/ syringe pumps
- Aqueous (non-alcohol) chlorhexidine cleansing agent – for skin
- Sterile water for skin clean post chlorhexidine
- Chlorhexidine in alcohol cleansing agent for lines & connections
- Omnipaque for CVL
- Sterile rubber tip forceps (for Broviac line)
- Tegaderm/Opsite for C.V.L.
- Screen/ “STOP” sign for doorway

NB: Plan workload to ensure adequate time for full procedure to be carried out, i.e. containment of the infant beneath the sterile drapes, insertion, position check and setting up of lines.

Procedure

Action	Rationale
1. Consider analgesia for baby – Dextrose Gel 40% if > 1000g	To minimise stress of the procedure
2. Plan timing: check that there are other staff in the room free to provide care for other infants. Consider the timing of other cares for the infant	Line changes can be long and complex. Nurses must minimise distractions to avoid errors
3. Ensure access to nursery restricted with screen and “STOP” signs prior to commencing procedure	To reduce risk of contamination of sterile field by traffic through the area
4. Clean trolley with Tuffie wipes and leave to dry	To minimise risk of contamination
5. Collect equipment required – do not open until medical staff ready to proceed.	To minimise exposure of sterile field to environmental contamination
6. Use the large bin for disposal of rubbish	To prevent contamination

7. Assist medical staff to gown up then prepare IA line tray and equipment as required.	
8. Assist with procedure as required	An active infant may require containment
9. Call for x-ray when the insertion is almost completed so the medical staff remains gloved and can give the contrast material immediately preceding chest x-ray. If there is a delay for x-ray, the medical staff will attach the Omnipaque (in a 5mL syringe) to the free end of the three-way tap (as per diagram). **ONLY Medical staff** to give the contrast material NOT the nurse.	Due to potential for adverse reaction to Omnipaque, medical presence is required



10. After the x-ray, the fluids can be connected when the position of UVC/CVL is confirmed. **3-way tap to be replaced with triple lumen smart site when fluids commenced – see Care Bundle 2.** *11. For Broviac, luer plugs can be discarded. The triple lumen can be connected straight into the Broviac (similar when connecting lines to the CVL or UVC).* ***NOTE**:* *Clamp the line using gauze and sterile rubber tip forceps. The line must only be clamped on the reinforced sleeve area of the Broviac. This area is thicker and marked on the line itself. Order extra supplies of the rubber tipped forceps when caring for a baby with Broviac.*	

3.2 CVL/UVC Line Changes and Maintenance Care Bundle

Line Change - UVC/CVL/Broviac line

Indications

- Every 72 hours lines, fluids, primary smart site triple lumen adapter and filter are changed on clear fluids.
- Every 24 hours lipids and all other medication infusions and extension lines are changed. Filters for medications remain for 72 hours; lipid filters change with 24 hour line change.
- D10W bags used for making up CVL medications must be labelled "CVL" and remain refrigerated, and once opened may be used for 8 hours then discarded.

NB: The fewer breaks into the line the less chance for infection.

Equipment

- Trolley
- Dressing pack
- CVL gown pack
- Caps and masks x 2
- Sterile gloves
- **UVC only** – sterile forceps
- Cleansing agent – chlorhexidine in alcohol
- Appropriate number of spare pumps for double pumping if required
- IV Solution and/or drugs as prescribed
- IV giving set and smart site double / triple lumen adapters as required
- Filters – for clear fluids and lipid
- Syringe pump extension sets
- Extension set - luer lock
- Bag access device if required
- Drawing up needles
- Filter needles
- Fluid balance sheet
- Line change recording sheet
- Treatment / medication sheet
- Screen/"STOP" sign for doorway

Central Venous and Umbilical Venous Line Management in Newborn Intensive Care Unit (NICU)

Procedure: Line Change

Action	Rationale
1. Perform hand hygiene	To minimise risk of infection
2. Place screen across nursery entrance as required and "STOP" signs for doorway	To minimise environmental contamination of sterile field
3. Collect trolley cleaned with Tuffie wipes and allow to dry	To minimise risk of contamination.
4. Collect required equipment as above and arrange on trolley extension away from sterile field	To minimise contamination when pack and equipment opened
5. Use the large bin for disposal of rubbish	To prevent contamination
6. Two nurses throughout procedure: one to be identified as the "sterile nurse" and one is the assistant	To facilitate sterile technique throughout
7. Checking prior to procedure (i) Check patient's identity. (ii) Ensure I.D. label matches patient's I.D. sticker on treatment sheet. (iii) Check fluids correspond with fluids prescribed on treatment sheet. *(iv) Two nurses should check independently the following:* Check drug doses and calculations with protocols and computer/calculator. *(v) Two nurses to set up the guardrails*	To ensure correct patient and comply with Waikato Hospital Medicine Management Policy
8. Put on masks and caps	To avoid airborne contamination
9. Perform hand hygiene	To minimise risk of infection
10. Assistant to open sterile CVL gown pack – sterile nurse to dry hands with sterile towels from gown pack; then sterile nurse put on gown and gloves in a sterile manner. Assistant to tie gown using both neck and waist ties	To minimise risk of contamination

11. Assistant to open dressing pack and equipment one by one allowing sterile nurse to: (i) open dressing pack onto sterile drape (ii) arrange equipment onto dressing pack.	To maintain aseptic environment and ensure maximum area for sterile field
12. Assistant to open chlorhexidine swabs using non-touch technique and 'pouch' the swab packet – sterile nurse to take swabs with forceps	Pouching the swab packet allows swab to be removed without contamination on edges
13. Assistant will hold bag of prescribed fluids and open blue tab. Sterile nurse to use chlorhexidine in alcohol cleansing agent to clean connectors and lines: using single swab wipe area thoroughly for 15 seconds and wait to allow solution to fully dry. Then use a fresh chlorhexidine swab to hold the line/connector before connecting I.V. giving set tubing and clear filter to end of giving set.	To maintain line and fluid sterility Chlorhexidine in alcohol needs to dry to prevent contamination of fluid and ensure maximum antimicrobial effect
14. Prime tubing, filter and ports slowly, checking tubing is free of air bubbles. Ensure connections are secure and all surface of giving set and inner section of connector ports remain free of excess lipid or dextrose solution. Flush emergency port with sodium chloride 0.9%.	To avoid air embolus and minimise potential for bacterial growth on line
15. When I.V. tubing has been primed, leave same on sterile field. Protect all key parts as per ANTT guideline. Draw up medications and prime into smart site ports – refer Part 1 of this document for line set up diagram and double pumping instructions	To maintain line sterility of all line connections Double pumping ensures even mixing of medications in extensions and avoid delays in drug administration
16. Once all fluids are connected and infusing, sterile nurse to wipe all ports with chlorhexidine in alcohol swabs	To remove fluid residue from outside of line (often dextrose) and reduce risk of microbial growth
17. Both staff together check all clamps are open and infusions running at correct rate. Check lines and ports visible and close incubator door.	Ensure no lines trapped in door or clamped which will delay medication fluid delivery
18. Sterile nurse to disrobe and both nurses to dispose of used equipment in appropriate receptacle according to Waikato DHB policies .	
19. Document fluids and line / filter change on recording sheet and medications on NICU drug chart. Label medication lines and infusion lines.	To identify change and calculate when next due.
20. Perform hand hygiene.	To minimise infection risk.
21. All infants with CVL must have: • hourly fluid balance and line pressure monitoring, • 3-4 hourly vital signs monitoring, • 2-4 hourly site observation • 3-4 hourly full inspection of insertion site, dressing and surrounding areas, e.g. limbs, during cares.	Early detection of complications enables early interventions

3.3 Additives via CVL / UVC Care Bundle

Indications

- Infants requiring electrolyte supplementation will be identified from daily U&E results. Burettes may stay in line for 72 hours and be accessed for top-ups under full sterile conditions.
- Infants requiring medication, e.g. antibiotic, caffeine, with no other IV access

Equipment

- Trolley
- Masks and caps x2
- Sterile gloves
- CVL gown pack
- Dressing pack
- Syringes and drawing up needles as needed
- Asena CC extension set/s
- Additives and diluents (electrolytes or antibiotics)
- Chlorhexidine in alcohol cleansing agent
- Sodium chloride 0.9% for flushes
- Screen/"STOP" sign for doorway

Procedure: two nurses procedure

Action	Rationale
1. Perform hand hygiene.	Minimise risk of infection
2. Place screen and "STOP" sign across doorway	To restrict access to nursery during sterile procedure
3. Clean trolley with Tuffie wipes and allow to dry	To prevent contamination of serile equipment
4. Collect equipment, additives/antibiotics to be administered. Two nurses to check : a. Medications as per Waikato NICU drug manual or computer programme. b. Correct patient & prescriptions as per Waikato DHB policy.	Waikato DHB medication safety policy requires two nurses to check all medications
5. Prepare UVC/ CVL antibiotics/additives using sterile technique, remaining medication may be offered to babies with peripheral IV.	To maintain asepsis of all devices fluids accessing the central line catheter and minimise risk of infection
6. Put on masks and caps and perform hand hygiene.	To minimise risks of airborne contamination and infection
7. Assistant to open CVL gown pack and sterile gloves and assist sterile nurse to put on gown and gloves.	To minimise risk of contamination
8. Drawing up medication • Medications / additives to be drawn up aseptically using ANTT principles. • Assistant ensures solution mixed following addition of medication.	To minimise risk of contamination. Adequate mixing ensures accurate dose administration

• Bungs and ampoule necks to be cleaned and opened by assistant using alcohol-chlorhexidine swabs. • Clean the bungs with chlorhexidine swabs before accessing the vial to draw up the medication.	To minimise risk of key part contamination.
9. Assistant will hold up C.V.L. / U.V.C tubing attached to baby. Sterile nurse will: • Grasp line with chlorhexidine swab and clean luer port & tubing with cleansing agent and allow to dry • Place sterile drape under connection and place cleaned connection onto drape • Line to be clamped off to fluids.	To maintain a sterile working field and protect key parts of CVL/UVC from contamination To avoid accidental bolus of drug or air to enter port
10. **For administration of additives to burette:** • Assistant to fill burette to 100mls with infusate as prescribed and hold for sterile nurse to clean access port with chlorhexidine – allow to dry. • Grasp access port with sterile gauze, add electrolytes and gently mix. • **Do not allow air inlet valve at top of burette to become wet when mixing.** • Clean port on burette • *If a new prescription of electrolytes, disconnect giving set at filter and run 25ml fluid through line – reconnect and assistant restart fluid at prescribed rate.* • Both nurses check connections and rate – ensure air inlet valve is unclamped. • Attach red Medication added label to burette.	Sterile nurse to remain sterile at all time when accessing existing burette. If air inlet becomes wet, air is unable to enter burette to replace infused fluid – negative pressure causes burette to collapse potentially interfering with delivery and line patency. Ensures line is primed with fluid with new prescription and thus no delay in medication reaching baby. Medication safety and WDHB policy.
11. **For administration of antibiotics:** • **Use 5 ml syringe** for all flushes and meds to ensure even pressure. *If the medication is a small amount, transfer it to a 5ml syringe, dilute if needed, then administer (use 10ml syringe for Broviac).* • If UVC / CVL has neonatal solution and/or lipid, ensure adequate amount of flush is used to clear extension line of solution. • Administer antibiotics/additives. Ensure UVC/CVL is flushed thoroughly after medications using at least 2 ml of sodium chloride 0.9%.	Use of smaller syringes may create high pressures and rupture catheter Most of the medications are incompatible with TPN fluids or other medications
12. Open port again to fluids, both nurses to check and recommence infusion as prescribed. Wipe down port and line again with cleansing agent.	Ensure correct delivery of prescribed fluids To remove fluid residue from outside of line (often dextrose) and reduce microbial growth
13. Document antibiotics/additives on NICU Drug Administration Record Sheet.	Waikato DHB medicine management policy requirement
14. Dispose of used equipment, then re-clean trolley with Tuffie wipe, and perform hand hygiene.	Minimise risk of injury and infection

3.4 Emergency Management of CVL Occlusion Care Bundle

Indications

- Air detected in the line
- Occlusion alarm
- Fluid bag or burette running out unexpectedly
- Any situation where forward flow of fluid is halted more than momentarily.

Equipment

- Emergency access port. This is the triple lumen port with green flag, attached to the CVL or UVC.
- Dressing pack
- Masks & caps
- Sterile gloves
- Sterile gown pack (if time allows)
- 5 ml syringes (+ drawing up needle) or 10ml syringes for Broviac line
- Sodium chloride 0.9% ampoule
- Chlorhexidine in alcohol cleansing agent

Procedure to be carried out promptly by experienced senior nurse with advanced certification, Co-ordinator/ACNM or medical staff. If in doubt, call for assistance.

Procedure

Action	Rationale
1. Check that no mechanical occlusions interfering with flow, e.g. limb position, line kinked in door, clamp not opened etc.	May avoid unnecessary access to line
2. Prompt attention to alarm is essential. Call ACNM/Coordinator/medical staff to baby's bedside urgently.	To initiate prompt action to prevent line blockage. **Small bore lines in small vessels potentially occlude quickly.**
3. Clean trolley with Tuffie wipes and collect equipment. Due to potential urgency, this procedure may not be performed under optimal sterile conditions – consider vancomycin administration and line change following clearance.	
4. Perform hand hygiene	To minimise risk of infection
5. Use sterile technique as per line maintenance bundle and draw up 2 ml of sodium chloride 0.9% into a 5 ml or 10ml syringe	5 m or 10ml syringe generates less pressure, thereby decreasing risk of dislodging clots that may have formed.

6. Attach the filled syringe to the emergency port. If Port 3 is in use with inotropes, access Port 1 via green flagged lumen – *remember lines may need to be changed again after access* Up to 2ml of sodium chloride 0.9% should be flushed gently through the line using a 5ml/10ml syringe.	Line is small bore; excess pressure should not be applied.
7. This procedure should only take a minute or two, and should be instituted before other measures are taken, e.g. to remove air from lines or change lines etc.	To try and avoid blood flow back into the line and hence clotting in the line.
8. Dispose of sharps and used equipment in designated receptacle, and re-clean trolley with Tuffie wipe.	To avoid needle stick injury and maintain environmental hygiene
9. Document procedure in clinical notes	

3.5 Bundle of Care for CVL / Broviac Hickman catheter dressing

- **CVL dressing is the responsibility of the medical team.**
- **Broviac dressings may be changed by senior nurses competent with this procedure.**
- **Two-person procedure**
- **Check with medical staff – prior to starting to verify standard dressing change remains the appropriate choice.**

Indications

Correct dressing management is critical to preventing infection. The dressing protects the insertion site and cannulated vessel from trauma and keeps the site clean and dry.

- CVL dressing to be changed PRN only or earlier if any signs of soiling, kinking or dressing lifting etc.
- Broviac dressing to be changed every 7 days or earlier if any signs of soiling, kinking or dressing lifting etc.

Equipment

- Trolley
- CVL gown pack
  Spare sleek dressing tape
- Masks and caps x 2
- Sterile gloves
- Chlorhexidine in alcohol cleansing agent for line
- Aqueous (non-alcohol) Chlorhexidine cleansing agent for skin
- Sodium chloride 0.9%
- Cavilon™ sticks
- Sterile jumbo matchstick swabs
- Sterile gauze
- Sterile scissors
- Sterile Steri-strips
- Transparent dressing e.g. Tegaderm/Opsite, IV3000 for Broviac

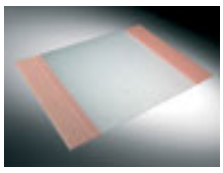
Procedure: Change CVL dressing

Action	Rationale
1. Inspect insertion site 2-4 hourly and during cares for signs of infection/infiltration, i.e. redness, swelling, tenderness, discharge or lifting of dressing	Early detection of complications. A swollen limb (or body part) near CVL insertion may indicate: 1. Displacement or tissue of CVL 2. Constriction due to tight dressing and/or tapes.
2. Check that transparent dressing is completely sealed, free from drainage and non-restrictive. • If so leave dressing unchanged. • Dressings change is not routine Evaluate appearance of catheter through insertion site transparent dressing. Observe that catheter is not stretched or pulled	Changing insertion site dressing may introduce bacteria into catheter and may inadvertently alter the position of the catheter tip. **Indications for changing dressing:** a. Partially lifted b. Evidence of leakage around insertion site c. Impaired venous return and/or tissue oedema distal to site

taut at its insertion into hub and that tape is not applied too tightly.	d. Restriction of circulation and/or movement. Catheter is very fragile and may tear if pulled.
3. Proceed with preparations as per Bundle of Care 3 – CVL/UVC Line Change and Maintenance	Maintain sterile principles to minimise contamination of line, insertion site or damage to catheter
4. Assistant to stabilise the CVL hub and loosen the dressing toward the insertion site, avoiding tension on the catheter. Stretching the dressing can assist.	Dressings can be adhered to catheter great care is needed not to cause catheter migration – easier for assistant to manage.
5. Medical staff to remove loosen old dressing carefully using forceps and discard into rubbish receptacle	Maintain sterile field and avoid contamination
6. Inspect the insertion site for signs of infection/infiltration i.e. redness, swelling, tenderness or discharge.	Identification of complications
7. If discharge present, clean with sodium chloride 0.9%, express any pus and take a swab.	To reduce skin flora present allowing laboratory to identify microorganisms in swab specimen
8. (a) **Clean skin insertion site** once with aqueous (non-alcohol) chlorhexidine cleansing agent and allow to dry (b) **Clean catheter/tubing and hub** with Chlorhexidine in alcohol from beginning at the insertion site and clean upward away from insertion site to catheter connection, taking special care not to pull on tubing. Allow solution to dry. • Gently coil the excess exposed silastic tubing and tape to skin with steri-strip (if not already done). • Place small piece of sterile duoderm on skin under blue hub (to protect skin) • Place transparent dressing over insertion site and hub – ensuring no kinks in line, if needed cover with a 2nd transparent dressing to ensure all exposed line is protected. **Please check with medical staff prior to commencing dressing change**	To reduce surface debris and cleanse tubing, thereby reducing the risk of infection under new dressing To reduce skin flora present on catheter and around connection. The transparent dressing allows easy visualisation of the site and is changed only if it is no longer adherent.
8. Document condition of insertion site and dressing change in clinical notes.	
9. Dispose of sharps and rubbish in designated receptacle, and clean trolley with Tuffie wipes.	According to Waikato DHB procedures

Central Venous and Umbilical Venous Line Management in Newborn Intensive Care Unit (NICU)

Procedure: Change Broviac Dressing

Action	Rationale
1. This is a sterile procedure, follow Bundle of Care 3: • Sterile nurse/medical staff to assemble CVL gown tray, chlorhexidine cleansing agents, sodium chloride 0.9%, Tegaderm (IV3000 standard), jumbo swabs and Cavilon™ wand. • Cut sleek strips from IV3000 standard dressing in half with sterile scissors 	
2. Assistant carefully removes previous dressing – CavilonTM stick may be used to loosen edge of Tegaderm if necessary.	
3. Clean insertion site and surrounding skin with aqueous (non-alcohol) chlorhexidine cleansing agent, starting at the catheter and working outward in a circular motion, allow to dry. Repeat for tubing – allow to dry. **Take special care not to pull on tubing.**	To reduce surface debris and cleanse tubing, thereby reducing the risk of infection. To reduce skin flora present on catheter and around connection.
4. Clean area again with sterile water and dry thoroughly with gauze	Maintain asepsis of insertion site
5. Carefully check insertion site and sutures	Ensure no signs of infection or migration of line
6. Use CavilonTM stick to wipe around skin area (away from insertion site) where transparent dressing will be placed, and allow to dry. **Coil or loop catheter tubing and secure with Steristrips prior to placing transparent dressing.**	Enhances adherence of transparent dressing
7. To secure the dressing • Cover area with IV3000 dressing, use sleek strips from dressing pack around the outside dressing. • Secure catheter outside dressing to skin with Steristrips or tape with Duoderm base to prevent tension on line and dressing **Exit line from side or bottom of dressing if possible to prevent baby's hands pulling out the line.**	To provide secure transparent aseptic cover over insertion site  
8. Dispose of sharps and rubbish in designated receptacle, and clean trolley with Tuffie wipes.	
9. Documentation & monitoring • Take photograph of line in situ following dressing change and keep in red care plan. • Document procedure in clinical notes. • Assess position and dressing integrity during cares and document on clinical notes.	To maintain accurate record of line placement and identify risk of catheter dislodgement.

3.6 Removal of CVL / UVC Care Bundle and disconnecting antibiotic lines

Indications

UVC: Currently removed and changed routinely to CVL at 7 days.
CVL: Lines are removed when infant's condition no longer necessitates its use or if complications require its removal.

NB: CVL gown pack not required for this procedure or disconnection of antibiotic extension

Disconnection of CVL medication (e.g. antibiotics, caffeine) extension: If an infant has had an infusion over time via a CVL, the extension may be left in the line until next line change OR removed using sterile gloves and chlorhexidine-alcohol prep pads while unscrewing and disconnecting. Ensure connection is thoroughly cleaned prior to unscrewing and disconnection.

Equipment

- Trolley
- Masks x2
- Sterile gloves
- Dressing pack
- Fine suture set (UVC)
- Transparent dressing (Tegaderm or Opsite) (CVL)
- Tape
- Chlorhexidine in alcohol cleansing agent for line
- Aqueous (non-alcohol) chlorhexidine cleansing agent for skin
- Cavilon™ stick
- Sterile laboratory specimen container (if needed)

Procedure: Two nurses procedure

Action	Rationale
1. Perform hand hygiene	To minimise risk of infection
2. Collect trolley cleaned with Tuffie wipes and allow to dry. Collect equipment, and arrange on cleaned extension arm of trolley.	To minimise risk of infection
3. Put on masks and perform hand hygiene.	
4. Assistant to open dressing pack and sterile gloves onto trolley. Sterile nurse to open and arrange sterile equipment on sterile field.	To avoid contamination of sterile field and minimise risk of infection
5. *TURN INFUSION OFF*	Prolonged stasis can cause thrombus formation.
6. Remove dressing • Assistant may use Cavilon™ stick to loosen transparent dressing/ bridging tapes.	To enable easy removal of dressing with forceps and prevent accidental tearing of

• Stabilise the CVL hub avoiding tension on the catheter. • Stretching the dressing can assist and remove dressing with forceps	line. To maintain a clean field and allow for easy removal of line though insertion site
7. Clean skin around insertion site with aqueous (non-alcohol) chlorhexidine cleansing agent.	To minimise risk of infection at site
8. <u>Removal of CVL</u>: • Grasp the catheter with forceps at insertion site and pull slowly 1cm parallel to the skin. Release and re-grasp the CVL at insertion site after each withdrawal. Ease line out with short smooth strokes. • Stop if resistance is felt. Assistant to reposition limb and attempt removal again. • If resistance persists, venous spasm may be the cause. Apply warm compress to limb for 15-20 minutes. Gently attempt removal again. <u>Never apply force</u>. • Inspect catheter (without contaminating tip) to ensure catheter is complete. • Place CVL tip in sterile container, check with medical staff whether the catheter tip is required to be sent to laboratory, if sepsis is suspected. • Apply continuous pressure to catheter insertion site for 5-10 minutes. • Dress CVL site with small gauze square and transparent dressing. • Remove dressing after 48 hours.	• Avoids excess tension on the line during withdrawal. • Assists the catheter to slide smoothly along the vessel towards the insertion site • Any excess pressure application during attempts to move catheter may result in catheter tearing or snapping inside vessel • To prevent bleeding from site
9. <u>Removal of UVC</u>: • Remove suture with sterile scissors and forceps. • Pull catheter from vessel slowly, over 5 minutes. • UVC site left uncovered – do not nurse infant prone for minimum of 4 hours post removal	To allow for visualisation and identify bleeding from umbilicus until scab formation complete.
10. Remove gloves, dispose of equipment, clean trolley with Tuffie wipe, and perform hand hygiene.	
11. Document procedure in clinical notes.	

4. Evidence Base

4.1 Associated documents

- Waikato DHB SS NICU Medical Protocol: Asepsis protocol for central venous catheter insertion and central venous line maintenance (2654)
- Waikato DHB SS NICU Nursing Procedure: Arterial lines – sampling, nursing management and removal (1638)

4.2 References

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